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(54) **Method of joining together pipelines which are laid on the seabed, and saddle for use with this method**

(57) A method of joining pipelines laid on the seabed, the diameter of a first pipeline (1) being at least several times greater than that of a second pipeline (2), through placement of a substantially continuous track of saddles (6,7) on the first pipeline, which saddles each lie against the outer surface of the first pipeline over at least part of the circumference thereof and over a certain length and which at their sides facing away from the first pipeline keep the second pipeline fixed relative to the first, using means present at this side which cooperate with the outer surface of the second pipeline, and a saddle for use in the above method.

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## Description

The invention relates to a method of joining together pipelines which are laid on the seabed, the diameter of a first pipeline being at least several times greater than the diameter of a second pipeline, through the placement of substantially continuous track of saddles on the first pipeline, which saddles each lie against the outer surface of the first pipeline over at least part of the circumference and over a considerable length thereof and which at their sides facing away from the first pipeline keep the second pipeline fixed relative to the first, using means which cooperate with the outer surface of the second pipeline.

Offshore activities for extracting oil and gas involve laying of pipelines. In many cases there is a need to lay pipelines against which a second pipeline or bundle of pipelines of smaller diameter is fastened, the latter containing cables, gas ducts, and the like. The pipelines are to be fastened to one another and fixed relative to one another by means of saddles, occasionally referred to as piggy backs, of a flexible material, such as rubber or PVC, which are clamped between the pipelines, for example by means of fastener bands around the pipelines, and which are provided at interspacings of, for example, 6 m seen in longitudinal direction. The two pipelines may alternatively be laid with their outer surfaces against one another, so touching one another, or at a distance from one another.

Such a method is described in the published Netherlands Patent Application no. 9000924. Reference is made therein to the difficulties encountered in keeping pipelines mutually positioned in a desired manner under the action of currents prevailing in the sea, while the vulnerability of the assembly to damage caused by trawl nets is also noted.

The measure suggested by the cited Patent Publication for counteracting the above disadvantages is to seal up the duct-shaped recesses which extend longitudinally along the pipeline.

Practice has shown that even with the use of the above measure the pipelines are still movable relative to one another in lateral direction under the influence of sea currents in an undesirable manner, and that the bundle is still prone to damage owing to trawl nets, especially at the rear/upper side of the second pipeline.

The method according to the invention increases the rigidity of the assembly of pipelines and reduces its vulnerability. The method is for this purpose characterized in that the second pipeline is entirely surrounded by said means at its side facing away from the first pipeline, i.e. its rear/upper side. The outer surface of the assembly is thus entirely formed by the outer surface of the saddle construction at the level of the second pipeline. The parts from which the saddle construction is formed are manufactured, for example, from highly impact-resistant PVC material. To hold the assembly together, use is made in known manner of, for example, stainless steel bands which are provided around it with interspacings of, for example, 50 cm.

It is noted that from British patent application number 2,165,579 it is in itself known to apply saddles which entirely surround the second pipeline. These known saddles however are not provided in a substantially continuous track but instead at relatively large interspacings and over-relatively short length. Accordingly the known assembly will still be relatively prone to damage owing to, for instance, trawl nets.

The means by which the second pipeline is surrounded are plate-shaped parts which are curved such that they lie at least partly against the rear outer surface of the second pipeline. Preferably, they lie against the entire or substantially the entire rear outer surface so that a completely smooth exterior is created; where they do not lie against any portion of the rear outer surface, for example with the purpose of applying a spoiler there, it will nevertheless be ensured that the second pipeline is completely surrounded, also the portion thereof mentioned above.

The invention also relates to an elongated saddle for implementing the method mentioned above. Such a saddle is characterized in that said means are adapted to the shape and dimensions of the second pipeline such that they completely embrace the second pipeline during use and lie at least partly against the outer surface thereof.

To make the outer surface of the assembly as smooth as possible, so that a maximum protection against outside influences such as trawl nets is obtained, the saddle construction is so designed that the outer surface thereof together with the portion of the outer surface of the first pipeline not covered by the saddle seat is coil-shaped during use, i.e. smooth and without recesses.

As was noted above, the portion of the saddle construction which surrounds the second pipeline is preferably provided with a mechanism by means of which a spoiler (a projection at the exterior of a pipeline or pipeline assembly whereby it buries itself into the seabed under the influence of sea currents) can be fastened.

The invention will be explained in more detail with reference to the drawing in which the first pipeline is referenced 1, the second pipeline 2 - possibly a bundle of separate pipelines tightly joined together - with respective outer surfaces 3 and 4. The pipelines 1 and 2 are bundled together, so that they lie with their outer surfaces 3 and 4 against one another at 5.

The pipelines 1 and 2 are held against one another by means of elongated saddles which bear on the outer surface of pipeline 1 with their plate-shaped curved parts 6 and 7 (the seats). The surfaces with which the seats bear on the outer surface are of ribbed construction to improve their grip. Typically the saddles are of the order of 3.6 m long and provided in a substantially continuous track.

The saddle is provided with means 8 and 9, also plate-shaped, which embrace the pipeline 2 in the sense that they each lie around a portion of the rear/upper side of pipeline 2 and bear on the relevant portions 8 and 9

of the outer surface, while they are joined together via the part 10, so that the pipeline 2 is fully surrounded.

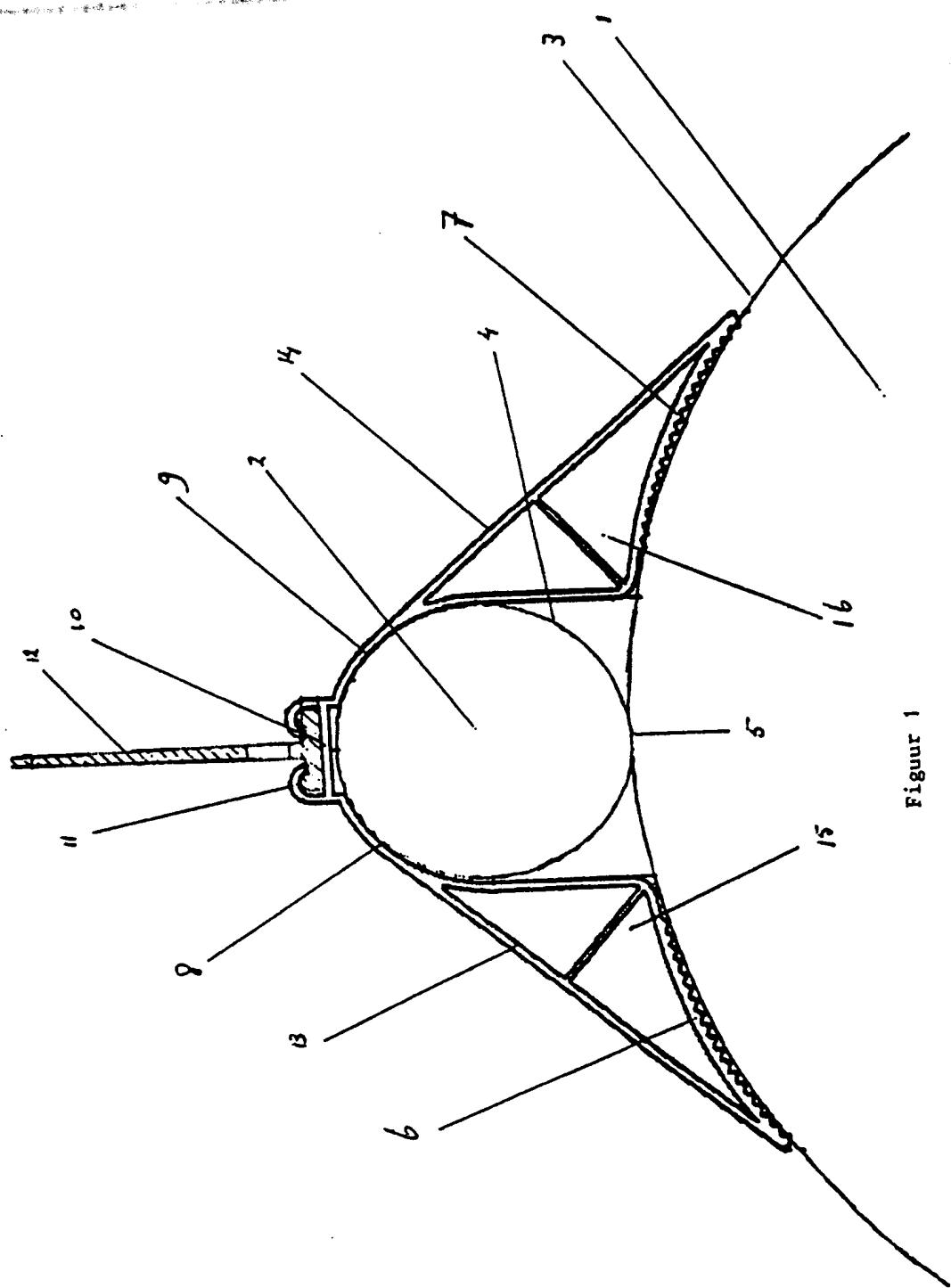
In the embodiment drawn, the means 8 and 9 are provided with a mechanism 11 at the rear/upper side of the pipeline 2 whereby a spoiler 12 can be fastened to the saddle in that location. If no spoiler is used, and accordingly no fastening mechanism for it is necessary, the means 8 and 9 may lie against the entire rear outer surface of the pipeline 2.

Parts 13 and 14 provided on the saddle so as to cover respective recesses 15 and 16 achieve that the assembly of the pipelines 1 and 2 has a smooth, coil-shaped exterior, while at the same time enhancing the rigidity of the assembly.

To fix the entire assembly of pipelines in one position, i.e. to prevent the pipelines from moving relative to one another in horizontal and/or vertical direction, the saddle is fixed on the pipeline 1 in usual manner by means of strips provided around the entire assembly with interspacings in longitudinal direction.

### Claims

1. A method of joining together pipelines which are laid on the seabed, the diameter of a first pipeline being at least several times greater than the diameter of a second pipeline, through the placement of a substantially continuous track of saddles on the first pipeline, which saddles each lie against the outer surface of the first pipeline over at least part of the circumference and over a certain length thereof and which at their sides facing away from the first pipeline keep the second pipeline fixed relative to the first, using means which cooperate with the outer surface of the second pipeline, characterized in that the second pipeline is entirely surrounded by said means at its side facing away from the first pipeline, i.e. its rear side. 25
2. A method as claimed in Claim 1, characterized in that said means lie over substantially the entire outer surface area of said rear side against said surface. 40
3. A saddle for implementing the method as claimed in Claim 1 or 2, essentially comprising an elongated seat with which it rests on the outer surface of the first pipeline during use and means by which it cooperates with the outer surface of the second pipeline at its side facing away from the first pipeline during use, characterized in that said means are adapted to the shape and dimensions of the second pipeline such that they completely embrace the second pipeline during use and lie at least partly against the outer surface thereof. 45
4. A saddle as claimed in Claim 3, characterized in that the saddle is constructed such that the outer surface thereof together with the portion of the outer surface of the first pipeline not covered by the saddle seat is coil-shaped during use, i.e. smooth and without recesses. 50



Figuur 1



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
Y,D	NL-A-9 088 924 (SUBMARINE PIPELINE SPOILER B. V.) * claims 1-8; figure 1 * ---	1-3	F16L1/20 F16L3/237
Y,D	GB-A-2 165 579 (CONOCO INC.) * abstract; figure 1 * ---	1-3	
A	GB-A-2 250 079 (M. W. HAROLD) * abstract; figures 1-5 * ---	1	
A	FR-A-2 526 886 (SOCIETE GORO SA) * figure 2 * ---	1	
A	FR-A-861 121 (COMPAGNIE POUR LA FABRICATION DE TUBES) * figures 3,4 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.)
			F16L
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	19 February 1996	Angius, P	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons  & : member of the same patent family, corresponding document	

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